


A **Punnett square** is a chart which shows/predicts all possible gene combinations in a cross of parents (whose genes are known). Punnett squares are named for an English geneticist, **Reginald Punnett**. He discovered some basic principles of genetics, including sex linkage and sex determination. He worked with the feather color traits of chickens in order to quickly separate male and female chickens.

Genetic Problem using Punnett Squares - Example and Steps

**Sample Problem -**

*In pea plants (which Gregor Mendel studied), tall pea plants are dominant over short pea plants. Using Punnett Squares, you can predict the genotypes and phenotypes of the offspring of a cross between a homozygous (purebred) tall pea plant and a homozygous (purebred) short pea plant.

Step 1.

Designate letters which will represent the genes/traits. Capital letters represent dominant traits, and lowercase letters represent recessive traits. **T** = tall **t** = short
Step 2.

Write down the genotypes (genes) of each parent. These are often given to you or are possible to determine.

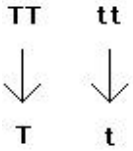
**TT** X **tt**

(tall) (short) - both homozygous (same) or purebred

Step 3.

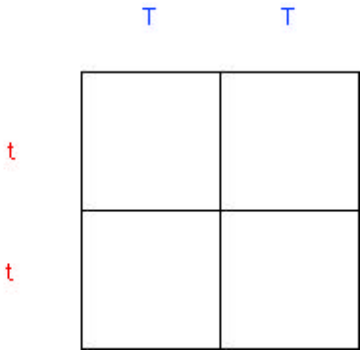
List the genes that each parent can contribute.

Parent 1 Parent 2



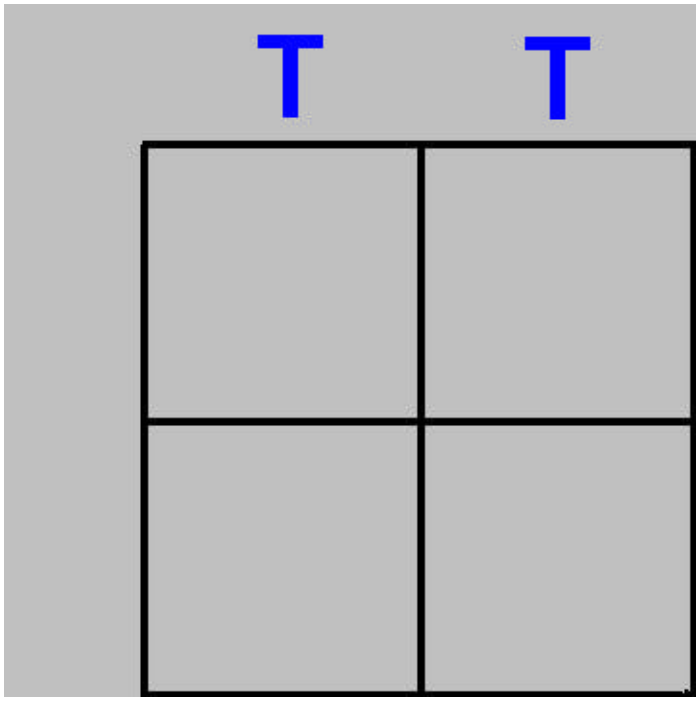

Step 4.

Draw a Punnett square - 4 small squares in the shape of a window. Write the possible gene(s) of one parent across the top and the gene(s) of the other parent along the side of the Punnett square.




Step 5.

Fill in each box of the Punnett square by transferring the letter above and in front of each box into each appropriate box. As a general rule, the capital letter goes first and a lowercase letter follows.




Step 6.

List the possible genotypes and phenotypes of the offspring for this cross.

The letters inside the boxes indicate probable **genotypes** (genetic makeup) of offspring resulting from the cross of these particular parents. There are 4 boxes, and the genotypic results can be written either as fractions or percents. In this case, all 4 boxes out of the 4 are showing the Tt genotype. Therefore, each of the offspring has a **4/4 or 100%** chance of showing the Tt genotype.

We have also written the **phenotype** (physical appearance) in each box under the genotype. Remember, T = tall and t = short (see step #1 above). Since a capital letter indicates a dominant gene, T (tall) is dominant over t (short). Therefore, each of the offspring has a **4/4 or 100%** chance of being tall.

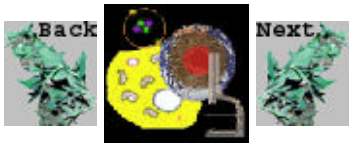
What are the possible genotype(s) of a tall plant?

What are the possible genotype(s) of a short plant?

What would be the phenotype of TT?

What would be the phenotype of tt?

Why is the phenotype of Tt tall and not medium/average?

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